Financial Ratios and Systemic Risk in Tehran Stock Exchange

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Abstract

This paper investigates the relationship between systemic risk and financial ratios in the Tehran Stock Exchange companies.

In the first step systemic risk estimated as a function of financial ratios, then the ratios affecting the systemic risk index were extracted using entropy method. In this regard 73 companies of the Tehran Stock Exchange during 2003-2010, were selected for statistical sample.

Output of this stage was introduction of five influential financial indicators in systemic risk Tehran Stock Exchange companies. By using t-test and Pearson correlation coefficients, effects of financial ratios on systemic risk index were evaluated and finally, using stepwise regression method, their effects were examined.

Based on the results, indices of "ratio of stock price to the profit of each share ", "current ratio", "each share profit ratio" and "stockholders rights return ratio" have the highest correlation with systemic risk index respectively.

Keywords: Financial and Accounting Ratios, Systemic Risk, Tehran Stock Exchange

Introduction

Risk and return are two important factors that are noted by investor in selection of investment projects. When future events are not entirely predictable risk factor would be higher. Awareness of rate of companies' risk also affects individual decision makings. Risk rate is defined as the probability of accessing actual return. Expected return is therefore divided into two main categories. Namely, those risks that are related to internal factors of company such as management, liquidity risks, risk of disability in paying debts (non-systemic or controllable risk). The second category includes those risks which are not associated to one or more company, but to general market conditions such as economic, political and social conditions etc. and known as systemic risk. Systemic risk is exogenous and uncontrollable and cannot be reduced by manager's sole decisions, and plays significant role in actual decisions of companies' managers and investors (Bildersee, 1975). As a result we are seeking for the fact that weather is a relationship between systemic risk of shares of companies in Tehran Stock Exchange (TSE) and accounting ratios? Or to what extent the systemic risk is related to changes of them.

Risk is defined as any phenomenon that would deviate investor's expected results (Gilb, 1996). For the first time, Harry Markowitz 1952, based on his proposed definition, introduced quantitative indicator for risk. He defined risk as a multi-period standard deviation of the corresponding variable. Hube (1998) defines risk as possibility of reduction in income or losing capital (Jones 1998). Indeed, risk is considered as two main bases of the investor's decision making and always considers the lowest risk as an appropriate criterion for investment. Overall risk is among the first concerns of investors.

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Risk of financial assets, in the short term, is always different from the long term.

Studies done inside and outside country showed the complexities of risk forecasting. Brimble and Hodgson (2002) studied the role of accounting information in estimation of systemic risk. Accounting variables under his study included the beta of accounting, profit changes, growth, size, profit payout ratio, current ratio, financial leverage, interest coverage ratio and operational leverage. He used the data of 123 companies within the period of 1991-2000. His obtained results confirmed that accounting variables explain more than 75 percent of systemic risk.

Jalilian (2010) conducted the presence of the significant relationship between the firm size (stock market value, office value of shares, company's sale and stock trading volume). He used the ratio of price to stocks profit as independent variable, and systemic risk and ordinary stock as dependent variables. 112 companies in TSE for 2004-2009 were studied. The results indicated the significant relationship between variables under the study. However, the relationship was not strong and reliable enough, and ultimately was not able to explain more than 31.4% of changes in systemic risk.

Khajavi (2004) tried to design an experimental model to estimate the systemic risk of the companies in TSE using accounting variables. He used immediate ratio accounting variables, debt ratio, ratio of net profit to sale, operational leverage, financial leverage, current ratio, current asset growth, fixed assets growth, firm size, assets return, net profit growth, shareholder rights return, sale growth, profit smoothing index, variability coefficient of profits, ratio of covering financial costs and proportion of profit distribution using the information of 40 companies during 2001. The results indicated that there is no relationship between current assets growth, fixed assets growth, net profit growth, ratio of financial costs coverage, ratio of profit distribution with systemic risk. There were reverse relationships between immediate ratio, ratio of net profit to sale, current ratio, firm size, return on assets, shareholders rights return, sales growth, profit smoothing index with systemic risk. Moreover, he observed positive relationships between debt ratio, operating leverage, financial leverage, profit variability coefficient with systemic risk.

Ahmadpour Gaskari (1999) predicted systemic risk using accounting information. Accounting variables used to predict the systemic risk were financial leverage, operational leverage, company size and selling rate. He used the information of 58 active companies in TSE during 1991-1995. He found that financial leverage has a positive relationship with systemic risk. Operational leverage and sale rate were not correlated with systemic risk; and the firm size had a negative relationship with systemic risk.

Methodology

Let us define the following financial ratios:

Expected range rate: The rate which we expect for the future considering the anticipation of profit and stock price (Goudarzi, 2004).
Ratio of each share profit: Each share profit is a ratio that expresses the periodical profit of the corporation based on each share of main owners, namely ordinary share. This ratio is the only proportion that is necessary to be presented in the financial reports (Nouravesh, 2006).
Current ratio: Measures the company's ability to repay short-term commitments and is calculated as dividing current assets by current debts (Parsaiyan and Jahankhani, 1997).
Ratio of stock price to profit of each share: The profit after deducting tax is divided by number of ordinary shares in hands of shareholders. (Parsaiyan and Jahankhani, 1997).
Ratio of net profit to sale: Amount of profit after deducting tax is divided by net sale (Parsaiyan and

Jahankhani, 1997).
Ratio of shareholders rights return: Companies profit per each Rial of the shareholders' rights. Profit after deducting tax is divided by shareholders rights (Parsaiyan and Jahankhani, 1997).

Considering the above financial ratios and also according to the type of data information of several companies in one or more financial years were used. The sample was selected from the companies in TSE whose fiscal year has ended in March and their information was accessible. Given the multiplicity of stock companies, their activity type, sizes etc., the conditional sampling method was used. In other words, some conditions were defined for homogenization and companies that have all required conditions were considered in the sample. Among all companies, those who had all following conditions were selected:

- Companies have been enrolled in TSE since March-April, 2001.
- Trading on their stock has not been interrupted for more than 5 months.
- The company was not among investment and financial intermediation companies.
- Financial year of company ends to 29th March.

According to the above conditions, the sample was extracted using "Rahavard-e-Novin" software. According to these criteria, among the 100 companies in TSE in 2001, 73 companies were selected, which form 59%of the whole stock market value in the end of 2001.

Hypotheses are:

1. There is a significant relationship between current ratio and systemic risk of companies in TSE.
2. There is a significant relationship between ratio of each share profit and systemic risk of companies of TSE.
3. There is a significant relationship between ratio of stocks price to each share profit and systemic risk of the companies in TSE.
4. There is a significant relationship between ratio of net profit to sale and systemic risk of companies in TSE.
5. There is a significant relationship between shareholders rights return and systemic risk of the companies in TSE.

Analysis

In all of the issues regarding evaluation and assessment, the presence of indices as the main criterion for evaluation is needed. We chose the effective indices based on entropy method. First the indices were identified. The most common indices include:

Leverage ratios:

X_1: Debt to asset ratio
X_2: Debt to shareholders' rights ratio
X_3: Financial expenses coverage (interest)

Profitability ratios:

X4: Net profit to assets (ROA)
X5: Net profit to net sales
X6: Gross profit to net sales
X7: Net profit to shareholders' rights (ROE)

Activity ratios:

X8: Trade receivables accounts to net sale
X9: Sale to assets

Liquidity ratios:
X10: Current ratio (current assets to current debt)
X11: Immediate ratio (immediate asset to current debt)
X12: Working capital to assets
X13: Cash holdings to assets
X14: Cash holdings to current debts

Each index is scored by managers. In the first stage, we converted qualitative information to quantitative one. For this purpose, we used Saati spectrum and in the second stage we normalized the obtained matrix. There are different methods for normalization of the matrix, including Saati norm, linear norm and Euclidean norm. In the present research, we use Saati norm which is the most common method. In the third stage indices' weights are extracted. There are different criteria for determining the indices weights. One of the most important mathematical methods for determining the index security coefficient is entropy method which is employed in this study. The criterion for weighing indices is the rate of information produced from each index, so that the index that can establish more distinction among the options, provides more information for decision maker and is more important. Regarding to the calculation of input variables in the system, 5 input variables were selected as follows:

- Ratio of each share profit
- Ratio of share price to each share profit
- Ratio of shareholders' right return
- Current ratio
- Net profit to sale ratio

To investigate the relationship between variables and test the hypotheses, Pearson's correlation was used. Correlation coefficient actually shows that in what degree one variable is linearly related to another.

Table (3) Correlation coefficient between independent variables and systemic risk

independent variable	Pearson coefficient	Level of significance
Current ratio	0.679	0.000
Ratio of each share profit	0.526	0.008
Ratio of share price to each share profit	0.782	0.013
Ratio of net profit to sale	0.113	0.300
Ratio of shareholders' rights return	0.456	0.008

In all cases where the amount of Pearson coefficient is smaller than the level of significance, null hypothesis is rejected and alternative hypothesis is confirmed. In other word, regarding table (3), there is a significant relationship between all independent variables and systemic risk except for net profit to sale ratio at 95% confidence level.

Considering that Pearson's correlation estimates the type and size of relationship between two variables that is the systemic risk with each of five given variables. To estimate the determination coefficients of significance of each of the five independent variables on systemic risk, stepwise regression was used.

Stepwise regression equation is an old method that enters into the equation step by step. So that independent variable with highest impact on the dependent variable is inserted to the equation first, then, other variables with less effectiveness in Spearman correlation is inserted in the next step etc. This continues as far as that the entering new variable is statically becomes insignificant. Applying stepwise regression is shown by table (4).

Table (4), Order of inserting variables in stepwise regression

Step	Order of inserting variables	Estimating equation	Coefficient of Determination
1	Ratio of share price to each share profit	$Y = 0.169 + 0.782\ X_3$	0.112
2	Current ratio	$Y = 0.123 + 0.642X_3 + 0.519\ X_1$	0.271
3	Ratio of each share profit	$Y = 0.143 + 0.612X_3 + 0.452X_1 + 0.346\ X_2$	0.380
4	Ratio of shareholders' right return	$Y = 0.101 + 0.601X_3 + 0.439X_1 + 0.309X_2 + 0.297\ X_5$	0.509

Amount of the coefficient of determination in final step, namely, R^2 is equivalent to 0.509, indicating that 51% of changes in systemic risk are explained by ratio of share price to each share profit, current ratio, ratio of each share profit and ratio of shareholders' right return.

Normality of the distribution of errors was checked. If errors were not normally distributed, the logarithms of variables are used instead. The regression standardized residuals were used for this purpose.

Collinearity is a condition where an independent variable is a function of other independent variable. To check collinearity, one may examine the correlation between the independent variables. High coefficient of determination may imply spurious regression. The null hypothesis of no collinearity (there is no internal correlation) versus alternative hypothesis of existence of collinearity (there is internal correlation) was tested. The higher the tolerance of the variables, the better would be the regression. Moreover, whatever greater the Variance Inflation Factor (VIF), the regression is inappropriate for prediction.

	Collinearity Statistics	
Dependent Variable: Y	Tolerance	VIF
(Constant)		
X1	0.963	1.038
X2	0.959	1.043
X3	0.915	1.312
X5	0.989	1.011

If Durbin-Watson statistic were between 1.5 and 2.5, null hypothesis of no serial correlation would be accepted. Given that computed Durbin-Watson statistic serial correlation of errors hypothesis is rejected.

Model	r	R^2	Adjusted R^2	Std. Error of Estimate	Durbin-Watson
1	0.716	0.513	.521	7.20331	1.787

Summary and Suggestions

According to Pearson correlation coefficient test, there is a significant correlation between all independent variables except for the variable of net profit to sale ratio with dependent variable at 95% confidence level. In other words, all five research hypotheses (Excluding the relationship of net profit to sales ratio variable with systemic risk) are accepted. Correlation coefficients of such indices as "the ratio of share price to each share profit", "current ratio", "ratio of each share profit" and "ratio of shareholders' rights return" have respectively the highest correlations with systemic risk index. So, it is suggested that for studying and predicating the systemic risk of the companies, the cited ratios be emphasized.

Regarding the fact that calculation of systemic risk using market index and other variables which have high limitations, especially in stock exchange, one may use informational values of financial ratios to estimate the systemic risk.

In the present study, single-variable regression was employed for studying the relationship between financial ratios and systemic risk. Using multiple regressions and studying simultaneous effect of variables on systemic risk in the selected companies may be the subject of further research in the field.

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